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On the Action of certain Vegetable Diuretics.

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The ensuing investigations consist mainly of repetitions of those performed some years since by Krahmer, and subsequently by Bird. They have reference to the appreciation of the influence of squill, juniper, digitalis and colchicum, over the quantity of the urine, its specific gravity and the amount of its solid organic and inorganic constituents. They were all performed upon healthy adult males.

The quantity of urine was determined in cubic centimetres, and the weight of the solids in grammes.

The method employed for the determination of the whole amount of solid matter was as follows:

Ten cubic centimetres of the urine were evaporated to as complete dryness as possible *in vacuo* over sulphuric acid, and the residue accurately weighed. By simple proportion the amount of solids in the whole quantity of urine was easily ascertained.

Although it is impossible to get rid of all the water by this process, the quantity remaining is extremely small, and the results obtained are far more accurate than those yielded by evaporating to dryness in the water bath as generally practised. No matter how carefully this latter method is conducted, the loss of urea by decomposition is always an important item, and involves far more serious errors than the imperfect desiccation by the former process.

For the determination of the amounts of organic and inorganic constituents separately, the solid residue obtained as above was mixed with ten or fifteen drops of moderately strong nitric acid, and gently heated till the mass was well dried. The heat was then gradually raised till all the carbon was consumed, and the mass in consequence became white. It was then cooled *in vacuo* over sulphuric acid and weighed. The inorganic matter was thus determined and the loss showed the proportion of organic substance.

**DIGITALIS.**—The subject of the experiments with this substance, was about twenty-five years of age and in good health. For the three days immediately preceding the commencement of the investigations the average quantity of urine daily excreted by him was 1474.5 cubic centimetres, the specific gravity was 1024.30, and the average total amount of solid matter was 75.31 grammes of which 30.17 grammes were inorganic, and 45.14 organic constituents. The digitalis was given in the form of the officinal tincture in doses of 20 minims three times in 24 hours, and was continued for three consecutive days. During this period the manner of living (food, drink, exercise, &c.) was as nearly as possible the same as during the preliminary investigations.

1st day. The urine passed on this day was of a pale straw color and feeble acid reaction; quantity 1950 cubic centimetres; specific gravity 1013.25; total solids 69.98 grammes, of which amount 31.27 were inorganic and 38.71 organic matter. The action of the digitalis was not manifested otherwise than by its effect upon the urine.

2nd day. The urine passed on this day was of similar physical character to that above mentioned. The quantity was 1873.6 centimetres, the specific gravity 1014.32, and the total solids 63.74 grammes. The inorganic solids amounted to 30.15 grammes, and the organic to 33.49.

The pulse on this day was somewhat slower and fuller than on the previous day.

3rd day. The quantity of urine evacuated on this day was 1624.9 cubic centi-

metres, and of specific gravity 1020.04. The total amount of solid matter was 67.29 grammes, of which 33.19 were inorganic and 34.10 organic.

The color, reaction and odor of the urine were similar to those of the two previous days.

The characteristic effects of the digitalis upon the action of the heart were well marked during this day.

The effect of the digitalis in increasing the amount of urine is seen to have been greatest on the first day. On the second day it had fallen somewhat, and on the third was but 150 cubic centimetres greater than when no digitalis was taken. The solids, it is seen, were less than the normal standard from the commencement, were still further reduced on the second day, and on the third were slightly increased. This diminution is perceived to have been owing to the lessened amount of organic matter excreted. The inorganic substances were somewhat increased in amount over the ordinary proportion.

**JUNIPER.**—The experiments with this substance were conducted on a healthy man thirty-five years of age. The average condition of his urine for the three days immediately preceding the investigations was as follows: quantity 1237.5 cubic centimetres, specific gravity 1022.50; total solids 61.23 grammes, of which 23.12 were inorganic and 38.11 organic matter. It was of ordinary color and odor, and of strong acid reaction.

Sixteen ounces of the officinal infusion of the berries of the *Juniperus communis* were taken during the twenty-four hours, and the manner of living kept as nearly as possible to correspond with that of the preliminary experiments.

1st day. For this day the quantity of urine amounted to 1732 cubic centimetres, the specific gravity of which was 1016.38; the total solids were 62.75 grammes; of this amount 25.43 grammes were inorganic, and 37.32 organic constituents.

The urine was of a pale straw color and gave off the characteristic odor produced by juniper. The reaction was feebly acid.

2d day. The quantity of urine passed on this day was 1885.2 cubic centimetres. The specific gravity was 1014.15, and the total solids 58.49 grammes, 22.17 of which were inorganic, and 36.22 organic matter. The physical characteristics were similar to those of the day before. The reaction was barely acid.

3d day. On this day the quantity of urine was 1672.5 cubic centimetres, with a specific gravity of 1018.41. The total solids amounted to 63.27 grammes, of which 27.50 were inorganic and 35.73 organic matter. The physical characteristics and reaction were the same as on the previous day.

From these experiments it is seen that whilst the quantity of urine was materially increased by the juniper, the amount of solid matter, as a whole, was but slightly affected, the loss in organic matter being about compensated for by the increase in the inorganic.

**SQUILL.**—The experiments with this substance were instituted upon myself, and were conducted upon the same general principles as the foregoing series. The average daily quantity of urine, for the three days preceding the investigations, was 1358 cubic centimetres. The specific gravity was 1023.51, and the total solids 69.35 grammes; of this amount 27.22 were inorganic and 42.13 organic matter.

I took two grains of the dried bulb of the *Scilla maritima* three times in the twenty-four hours. The other conditions remaining the same as in the preliminary examination of the urine.

1st day. The quantity of urine passed on this day was 1572 cubic centimetres of 1020.34 specific gravity. The total solid matter was 60.67 grammes, 31.07 of this amount being inorganic and 29.60 organic constituents. The urine was of feeble acid reaction.

2d day. Quantity of urine 1493.5 cubic centimetres, specific gravity 1020.90, total solids 58.22 grammes, inorganic matter 30.15, organic 28.07 grammes. The reaction, &c., were the same as on the preceding day.



3d day. On this day the quantity of urine amounted to 1535 cubic centimetres, and was of 1019.37 specific gravity. The total amount of solid matter was 61.58 grammes, of which 30.58 were inorganic and 31.00 organic constituents. The reaction, color, &c., were unchanged.

From the above experiments it is perceived that the action of the squill was similar to that of the digitalis and juniper, *i.e.* causing an increase in the water of the urine and inorganic solids, but a reduction of the amount of organic matter. The loss of organic matter was considerably greater than with either of the other substances.

**COLCHICUM.**—The investigations into the action of this substance were performed upon a healthy man 28 years of age. The urine for the three days immediately preceding the commencement of the experiments, was of the following daily average character. Quantity 1230 cubic centimetres, specific gravity 1025.08; total solids 63.12 grammes, inorganic matter 29.83 and organic 33.29. The reaction was very strongly acid.

One and a half drachms of the official tincture of the seeds of the *Colchicum autumnale* were given three times in twenty-four hours, and continued for three days. During this period the food, exercise, &c., were as nearly as possible the same as during the preliminary series.

1st day. The quantity of urine passed on this day was 1595.7 cubic centimetres, with a specific gravity of 1024.37. The total solids amounted to 77.29 grammes, the inorganic matter of which was 36.50 grammes, and the organic 20.79 grammes. The reaction was strongly acid.

2d day. Quantity of urine 1484.1 cubic centimetres, specific gravity 1024.31; total solids 75.22 grammes. The amount of inorganic matter was 35.01 grammes, and of organic 40.21. The reaction was very strongly acid.

3d day. On this day the quantity of urine amounted to 1620 cubic centimetres and was of 1022.06 specific gravity. The total amount of solid matter was 79.33 grammes, of which 34.20 were inorganic and 45.13 organic constituents. Reaction strongly acid.

It is thus perceived that the action of the colchicum, as compared with that of the other substances experimented with, was very remarkable, it being the only one with which there was an increase in the amount of solid matter eliminated, both organic and inorganic.

From the foregoing experiments the following table embracing the averages of each series of investigations is constructed.

|                                | Quantity of Urine. | Specific Gravity. | Total Solids. | Inorganic Solids. | Organic Solids. |
|--------------------------------|--------------------|-------------------|---------------|-------------------|-----------------|
| Normal Standard.<br>Digitalis. | 1474.5             | 1024.30           | 75.31         | 30.17             | 45.14           |
|                                | 1822.8             | 1015.87           | 67.00         | 31.54             | 35.43           |
| Normal Standard.<br>Juniper.   | 1237.5             | 1022.50           | 61.23         | 23.12             | 38.11           |
|                                | 1763.2             | 1016.28           | 61.50         | 25.03             | 36.42           |
| Normal Standard.<br>Squill.    | 1358               | 1023.51           | 69.35         | 27.22             | 42.13           |
|                                | 1533.5             | 1020.20           | 60.15         | 30.60             | 29.55           |
| Normal Standard.<br>Colchicnm. | 1280               | 1025.08           | 63.12         | 29.83             | 33.29           |
|                                | 1556.6             | 1023.58           | 77.28         | 35.23             | 42.04           |

From the foregoing investigations, I think it is deducible that neither digitalis juniper or squill, increases the total amount of solid matter eliminated by the kidneys, and that the organic matter is considerably reduced through their influence. Although they do increase the amount of inorganic matter removed through the urine, yet as it is the organic matter which is generally considered as contaminating the blood in disease, it is evident they exert no effect whatever in depurating this fluid, but on the contrary are positively injurious.

The results obtained, in so far as the experiments with digitalis, squill or juniper, are concerned, are similar to those obtained by Krahmer, but are materially different as regards the colchicum. For, although Krahmer found that under the influence of this medicine there was an increase in the amount of organic matter excreted, this was so small as to lead to the supposition that it may have been accidental, and besides there was a reduction in the quantity of inorganic substance removed. It is desirable, therefore, that we should have further observations with this article.